

# SRI International

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Monthly Status Report • March 2011  
Covering the Period 1 March through 31 March 2011

## **POWER MEMS DEVELOPMENT**

Contract N00014-09-C-0252

Submitted in accordance with Deliverable A001 - Monthly Technical and Financial  
SRI Project P19063

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Report Documentation Page			Form Approved OMB No. 0704-0188		
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1. REPORT DATE <b>MAR 2011</b>		2. REPORT TYPE		3. DATES COVERED <b>00-00-2011 to 00-00-2011</b>	
4. TITLE AND SUBTITLE <b>Power Mems Development</b>			5a. CONTRACT NUMBER		
			5b. GRANT NUMBER		
			5c. PROGRAM ELEMENT NUMBER		
6. AUTHOR(S)			5d. PROJECT NUMBER		
			5e. TASK NUMBER		
			5f. WORK UNIT NUMBER		
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>SRI International, Menlo Park, CA, 94025</b>			8. PERFORMING ORGANIZATION REPORT NUMBER		
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)			10. SPONSOR/MONITOR'S ACRONYM(S)		
			11. SPONSOR/MONITOR'S REPORT NUMBER(S)		
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT <b>Same as Report (SAR)</b>	18. NUMBER OF PAGES <b>4</b>	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>			

## **MICROELECTROMECHANICAL SYSTEMS (MEMS) RESETTABLE CIRCUIT BREAKER (TASK 1.1) AND MEMS SWITCH FOR DC-DC VOLTAGE CONVERTERS (TASK 1.2)**

**Task 1.1 Contributors:** Sunny Kedia, Weidong Wang, Susana Stillwell

**Task 1.1 Deliverable:** 10 prototype packaged MEMS-based resettable circuit breakers for testing and analysis in the Office of Naval Research (ONR) laboratories.

**Task 1.2 Contributors:** Sunny Kedia, Christel Munoz, Weidong Wang, Scott Samson, Drew Hanser

**Task 1.2 Deliverable:** Functional MEMS-based DC-DC converter in a vacuum package.

### **Summary:**

We continued development on the Version 3.1 (V3.1) DC-DC converter design using the polymer sacrificial-layer-style switches. To ensure that each switch was electrically isolated, the V3.1 switches were fabricated on three glass wafers. The structural layer consisted of silicon oxynitride deposited at 300°C. We observed some polymer delamination on less than about 10% of the wafer. Wet etching of the structural layer in buffered oxide etchant resulted in significant lateral undercutting and breaking of the switches at the anchor points during wet release.

We electrically tested 13 switches and observed electrostatic movement between 5 and 30 V, depending on the switch style. No switch closure was observed, even when electrostatic actuation occurred.

We are currently designing a revised mask design that incorporates more robust anchor points, larger electrostatic electrodes, and larger switch contact regions without release holes. We will fabricate the next set of switches following completion of the mask design.

## **DIAMOND HEAT SPREADER OR HEAT SINK FOR HIGH-POWER MEMS SWITCH APPLICATIONS (TASK 1.3)**

**Contributors:** Priscila Spagnol, Shinzo Onishi, Drew Hanser, Weidong Wang, Sunny Kedia, John Bumgarner

**Deliverable:** Prototype device fabricated on a thin-film diamond heat spreader layer and individual samples of diamond on Si or other suitable substrates for material evaluation.

**Summary:** No work was done this month on Task 1.3.

## **POSITRON TRAPPING AND STORAGE (TASK 2)**

**Contributors:** Ashish Chaudhary, Friso van Amerom, Tim Short

**Deliverable:** A minimum of four MEMS-based trap structures for radio frequency (RF) trapping of electrons.

**Summary:** No work was done this month on Task 2.

## FINANCIAL STATUS

### R&D Status Report

#### Program Financial Status

15 July 2009 through 26 March 2011

Contract Item No.	Current Funding	Current Period Expenses	Cumulative Expenses	% Budget Complete
0001	\$1,829,849	\$18,425	\$1,630,247	89%
Project Commitments		(5,946)	208,261	
Total	\$1,829,849	\$12,479	\$1,838,508	

#### Based on currently authorized work:

Is current funding sufficient for the current fiscal year (FY)? (Explain if NO) **Yes**

What is the next FY funding requirement at current anticipated levels **N/A (base fully funded)**